

Studies on the Prevention of Tooth Decay

Progress Report--July 1, 1953 to December 31, 1953

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Annual Rate:	December 1, 1952--November 30, 1953	\$ 16,618
	December 1, 1953--November 30, 1954	\$ 8,315

1. The specific objectives of this project are:

a. To determine the caries-susceptibility of genetically homogeneous strains of rats and mice.

b. To investigate constitutional differences between caries-resistant and caries-susceptible strains of mice and rats.

2. The progress made in the past six months can best be reported in two parts which are comparable to the above objectives.

a. Caries-susceptibility. Young representatives of six strains of rat (Mus norvegicus) were purchased from the Wistar Institute in the early weeks of the contract and allowed to adjust themselves to the controlled environmental circumstances of this laboratory. During this period and continuously throughout their breeding life, they were maintained on standardized purified rations. The representatives of each of these strains established a small breeding colony. By way of summary, it can be stated that the 24 young adults purchased as foundation stock for these strains produced a little over 200 offspring. Of this first generation, 120 were taken for preliminary experimental tests of the caries-susceptibility of the respective strains. At weaning each litter was divided into three groups, the first of which was fed our standard, cariogenic, purified ration, the second received the Navy modification of the Hoppert-Webber-Canniff diet, and the third was maintained on McClure's heated cereal diet.

Since the 24 original adults have passed their normal breeding span, they were sacrificed. Although maintained on the purified, cariogenic breeding ration for periods of not less than 12 months, none of these rats developed carious lesions.

The 120 representatives of the first generation of these six strains were maintained on the three diets for periods up to 7 months. At the end of this time the great majority of these rats were caries-free although the occasional animal in two of the six strains, Wistar chocolate and Wistar waltz-whirler, had a low dental caries experience. On the basis of these 120

AD No 24-811
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animals from the first generation, one could reach a logical conclusion that these strains were all quite highly resistant to tooth decay. This was true regardless of the composition of the diet used.

The remaining 80 members of the first generation were maintained in the stock colony as breeding stock whose entire dietary background was known and controlled. The oldest members of the first generation were mated and some bore young in early July. The second generation offspring have been used for more exacting experimental tests of caries-susceptibility than would be possible with the first generation animals.

There are approximately 200 offspring of the second generation on experiment at the present time. In addition several of the earlier litters were sacrificed and evaluated in late December. Preliminary data are available for small numbers from two strains, Wistar chocolate and Wistar waltz-whirler. It is interesting to report that these data for representatives of the second generation where we have had full control of the entire reproductive cycle indicate appreciable differences in caries-susceptibility. The primary observation is that there is a wide variation in caries-susceptibility among representatives within each of these two strains. This observation is entirely in keeping with observations made in this laboratory 7 to 9 years ago when the search for a caries-susceptible strain of rats was first begun. No strain tested then had a uniform caries-susceptibility despite controlled environmental conditions. Secondly, the representatives of the waltz-whirler strain have on the average an appreciably higher susceptibility to caries than the representatives of the chocolate strain. The overall average caries incidence among all members of the second generation is appreciably higher than for the 120 members of the first generation. This observation clearly indicates the necessity to carefully define the full environmental circumstances under which a judgement about caries-susceptibility is made.

The studies with mice which were to have begun during the summer were not undertaken because of the notification that funds for the second contract year would have to be reduced to 50 per cent of the first year.

b. Genetic Constitution

The composition of the teeth and the mineral metabolism of strains of rat which have widely divergent caries-susceptibilities are being studied. Good progress has been made in the former area and somewhat slower in the latter. As yet there have been no observations which are sufficiently striking to comment on by reason of the similarities of the strains in the various criteria for which we have been testing. Numerous analytical problems of a nature concerned with our small samples have been encountered but it has been possible to select alternate procedures or to devise modifications in procedures which would permit analysis.

3. No papers have been published nor manuscripts submitted during the second six months of operation.

4. (a). There has been no change in direction or emphasis of the project since its inception. The early results reported above indicate the necessity to pursue the original objectives exhaustively before any change would be indicated. The difference in caries-susceptibility between the first and second generations is a clear cut indication of the validity of the procedures and the need for prolonged periods of investigation before the final appraisal of the caries-susceptibility of a strain is made. Due to the reduced budget for the second year of the project it has been necessary to seek support from another source for the caries-susceptibility trials in mice and for the detailed studies of the biochemical differences between strains of laboratory rats with varying caries-susceptibility.

(b). Professional assistant--Aina Marija Auskaps, D.D.S. (Munich) resigned from the project on October 1, 1953. This was regretted by the principal investigator by reason of the invaluable services that she rendered during her period of employment. In view of the reduced budget to begin December 1, 1953, it was judged to be necessary to accept her resignation and an opportunity was provided for her to enter the 3rd year class of the Harvard School of Dental Medicine.

Animal caretaker--Alexander Bennett was dropped from the payroll and replaced by Vilis Purmalnieks on a half-time basis, beginning in late July. Due to an accident in the animal house, he was discontinued and has not been replaced as yet.

Analyst--Ora L. Ashley has continued to give faithful service in the prosecution of the project.

(c). No graduate students are connected with this contract at the present time.

(d). As outlined in our letter of January 19, 1954 to Commander Ludwick, research support has been granted by the U. S. Public Health Service beginning January 1, 1954 to permit the investigation of the caries-susceptibility of genetically well-defined strains of mice and to explore the biochemical differences in constitution between caries-susceptible and caries-resistant strains of rodents. No other research support has been received or withdrawn by other sources for the studies being conducted under this contract.

(e). No difficulties have been encountered as yet, except for analytical problems which arise periodically because of the small samples available. So far these have been surmounted without incident.